

Island County-WRIA 06 Salmon Strategy

Introduction

This introduction presents an assessment of the habitat factors limiting salmon productivity in the freshwater streams, estuaries and nearshore saltwater habitats of Water Resource Inventory Area 06 (WRIA). WRIA 06 encompasses all of Island County, including the following islands Whidbey, Camano, Ben Sur, Smith and Strawberry. Whidbey and Camano, the two largest islands, are the focus of this strategy. Together they cover about 334 square miles (538 km²) and include 123 sub-basins.

Watershed Description

The natural characteristics of WRIA 06 are directly affected by human population and land use. Island County is the second smallest county in Washington State but has the second fastest growing population in the State. Between 1980 and 1990, the County's population grew by 37 %, the highest in the state. The 1997 population was 71,600. Residential development encompasses much of the WRIA 06 shoreline and is expanding into rural and forested areas. The shorelines are in high demand for private beachfront homes and sites with scenic vistas of the water and mountains. Recent studies have indicated that 22% of the Whidbey Island shoreline has been armored.

Agriculture has been an important historical land use in WRIA 06, though it is relatively small in comparison to other counties. In 1997, there were 622 parcels (32.8 square miles-52.8 km²) of land in agricultural tax programs. Of this total, 25 square miles (40.2 km²) were in parcels 20 acres(0.08 km² or larger. In 1987, there were only four farms over 500 acres (1.24 square miles -2.0 km²) in size.

Distribution and Condition of Stocks

Virtually no historical information concerning the presence of anadromous salmonids in WRIA 06 has been located. A systematic interview of long-time County residents is probably the only way to obtain an historic perspective of fish presence in this area. What is known is that the islands in WRIA 06 are located at the junction to Puget Sound and in front of some of the most productive salmon-producing rivers (Snohomish, Stillaguamish, Skagit) in western Washington. Historically, this area has served as "one of the most important and critical harvest areas for commercial and sport

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1 fisheries.” From a regional standpoint, Island County’s major contribution to
2 salmon productivity is its functioning estuaries and nearshore habitats.
3 The WRIA 06 nearshore environment includes numerous estuaries and salt
4 marshes that are or have the potential to be essential rearing habitat for
5 juvenile salmonids. These environments provide important habitat for
6 spawning herring and other forage species that are a critical food source to
7 migrating adult salmon salmonids.

8
9 The WDFW marine fry nearshore surveys for WRIA 06 are used to forecast
10 the number of adult pink and chum salmon returning to the Snohomish and
11 Stillaguamish Rivers. Juvenile Chinook caught for research purposes in the
12 nearshore habitat of north Whidbey Island were assumed to originate from
13 the Skagit River. All species of juvenile salmon use nearshore habitats in
14 Puget Sound at either the fry and/or smolt life stages.

15
16 Most WRIA 06 streams are intermittent or ephemeral, and generally do not
17 provide a sufficient flow of water to support salmonids. Others, such as
18 Maxwellton and Glendale Creeks on Whidbey Island and Chapman Creek on
19 Camano Island, are presumed to flow throughout their length year-round and
20 to support small populations of resident and anadromous salmonids. Nine
21 creek sub-basins in WRIA 06 are currently known to support salmonids (
22 Maxwellton, Glendale, Chapman, Dugulla, North Bluff, Cultus, Deer, Old
23 Clinton and Cavelero). Six additional creek sub-basins have been identified
24 as having a high potential to provide salmonid habitat (Lone, Crescent,
25 Kristoferson, Swantown, Carp and Brookhaven).

26
27 The streams in Island County have received little attention from state
28 fisheries managers because they are too small to support commercial runs.
29 Accordingly, there has yet to be a systematic survey of existing salmonid
30 habitats and populations. Most of the information documenting fish presence
31 was gathered by WDFW personnel as part of culvert and flow inventories
32 conducted for regulatory purposes (Base 1999). There are an estimated 60
33 tributaries that have not yet been evaluated to determine their status as either
34 fish supporting or with the potential for providing salmonid habitat.

35
36 The 1992 *Washington State Salmon and Steelhead Stock Inventory* (SASSI)
37 identifies only one stock in WRIA 06. Coho are described for the
38 Maxwellton Creek drainage but stock status is unknown. Coho and chum are
39 known to occur in freshwater streams on Whidbey Island. The origin of both

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stocks is unknown. Coastal cutthroat are present in streams on Whidbey and Camano Islands. A systematic stream survey and genetic analysis of all salmonid species in this WRIA are warranted.

There has been no systematic survey of salmonid use of nearshore and estuarine habitats in WRIA 06. Data from four state and tribal studies were used in Limiting Factors (April 2000) to document nearshore habitat use by chum, pink, chinook, coho, sockeye, steelhead and char at several locations in WRIA 06. Twenty estuary/salt marsh sites in WRIA 06 are presumed to support or have been identified as having the potential to support salmonids.

In March 1999, Puget Sound chinook stocks were designated as threatened under the federal Endangered Species Act. There are no streams in WRIA 06 of sufficient size or flow to provide spawning habitat for adult chinook. However, juveniles may use the lower stream reaches for rearing, and they are presumed to use the entire nearshore habitat and open estuaries of WRIA 06. They have been documented along the shoreline at: the north end of Whidbey Island, and the south end of Whidbey and Camano Islands.

In October 1999, bull trout were listed as threatened under the federal Endangered Species Act. Neither bull trout nor Dolly Varden are known to occur in the fresh waters of WRIA 06. Native char are presumed to use nearshore habitat, but only one Dolly Varden has been documented in the data sources. Bulltrout and coastal cutthroat are reportedly caught by sport fishermen in some nearshore areas of WRIA 06.

Habitat Limiting Factors

There are several habitat factors negatively affecting salmon and their habitats in WRIA06. The major factors are discussed below.

Streamflow. Low flows are presumed to be a key habitat factor in this WRIA. However, streamflow data is lacking for most of the streams known to support or identified as having the potential to support salmon. Sufficient information to accurately pinpoint temporal and spatial flow deficiencies or to determine that low flows are not an issue has not yet been collected.

The streams in Island County are tiny when compared to the rivers found in other parts of Puget Sound. Most are short, coastal tributaries that flow

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1 intermittently due to precipitation patterns, lack of snow accumulation, soil
2 conditions, and topography. They tend to be shallow, have relatively low
3 discharge, and reduced flows during the summer months when precipitation
4 is low. Wetlands and groundwater springs provide the headwaters and
5 baseflows. The perennial streams are predominantly located in the southern
6 part of Whidbey Island, and are fed by year-round springs and forested
7 wetlands. They often have shallow gradients and low velocity. These
8 streams are too small to support habitat for adult chinook salmon, pink
9 salmon, and steelhead.

10
11 In Puget Sound, low streamflows are generally most problematic from July
12 through September. The cumulative effect of groundwater withdrawals and
13 loss of wetlands can contribute to low flows. Low flows can cause salmon to
14 be stranded, limit or impede salmon migration, and contribute to a decrease
15 in dissolved oxygen, an increase in water temperature, and an increase in the
16 concentration of pollutants. A cursory analysis of projected effective
17 impervious area suggests that if the County's zoning designations are
18 actualized, impaired and moderately impaired streamflows may be expected
19 in most of the known and potential fish-bearing sub-basins in WRIA 06.
20 Hence, the potential exists for future reductions in streams with naturally
21 low streamflows and for "flashy" streamflows similar to what has happened
22 to many urban streams in Puget Sound.

23
24 *Access.* Access is a major habitat factor in WRIA 06. Culverts, tide gates,
25 and dikes are the main structures impeding or preventing fish passage. A few
26 small dams are also present. There are only four sites, identified as being
27 important to salmon, which do not have access issues. Only a limited amount
28 of information was available for two additional sites. They require further
29 investigation.

30
31 Low stream flow or temperature conditions can also function as barriers to
32 fish passage during certain times of the year, particularly during the summer.
33 As discussed above, data are currently lacking to determine if these types of
34 access problems exist at any of the known or potential salmon-bearing sites.

35
36 *Flooding and Tidal Flows.* Freshwater and tidal flooding and storm-related
37 flooding are natural processes that are critical to creating and maintaining
38 the health of floodplain and nearshore ecosystems for salmon and other
39 organisms. Flooding occurs generally in the winter in concert with storms,

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high tides, and seasonally high precipitation. The last large flood event occurred in December 1996. Low-lying areas along the west shoreline of Whidbey Island are most susceptible to flooding from storm surges and high wind-generated waves.

Much of the habitat damage to the salt marshes and estuaries in WRIA 06 has resulted from the loss of connectivity to Puget Sound tidal waters. Agriculture and shoreline residential development has had the biggest impacts on tidal connectivity. In the early 1900s, drainage districts were established in agricultural areas to move water off of the land and allow for development. In more recent decades, numerous residential developments have been constructed on natural or augmented sand spits to raise homes above tidal flood levels, creating a barrier to saltwater flow. The larger sites that have been impacted by a loss of tidal connectivity include Deer Lagoon, Crockett Lake, Dugualla Bay, Cultus Bay, Swantown Marsh, Maxwellton Estuary, and Crescent Marsh.

Riparian Conditions. There is currently no quantitative information concerning the riparian zones for streams and estuaries in WRIA 06. Qualitative field assessments have been made.. Generally speaking, the riparian zones in agricultural and urban areas have been the most heavily degraded, and in some areas, are totally gone.

Estuary and Nearshore Habitats. Whidbey and Camano Islands historically supported a number of estuaries and other nearshore ecosystems. As already mentioned, most of these sites have been heavily modified by agricultural, residential and other land uses. Other nearshore sites are still functioning with natural processes but are under private ownership and vulnerable to future disturbance. Loss of access to fish passage, loss of connectivity between streams and tidal waters, and degraded riparian habitat are the main habitat factors.

Shoreline residential homes continue to have a major impact on the nearshore environment. Once the homes are built, property owners often construct bulkheads to protect them from erosion. Bulkheads, docks, groins, and marinas all impact salmon habitat. Water quality impacts occur when septic systems are installed for domestic sewage and experience flooding in relation to naturally fluctuating water levels.

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Non-native cordgrasses (*Spartina*) also pose a threat to some WRIA 06 nearshore areas. Cordgrass invasions eliminate native salt marsh vegetation, displace native plants and animals, raise the elevation of the estuary substrate, and lead to an increase in flooding. The primary areas targeted for *Spartina* control are located around the north half of Camano Island. They include Davis Slough, West Pass, Livingston Bay and Triangle Cove. Much smaller infestations occur around Whidbey Island. There, control activities are in place at Cultus Bay, Deer Lagoon, Lake Hancock, and other locations.

Water Quality. Nonpoint source pollution is a major cause of water quality pollution in Puget Sound. For salmonids, high water temperature and low dissolved oxygen are the main water quality concerns. High temperatures can lower dissolved oxygen, impair the immune system of salmon, and give non-native warm water species a competitive edge over native salmonids. There are limited water quality data available for known and potential salmon-bearing streams in WRIA 06, but most of the information was gathered at times when temperature and dissolved oxygen conditions would not be expected to be problematic. Additional low flow data are needed for all of the known and potential salmon-bearing streams that have been identified.

Habitat In Need of Protection

Properly functioning habitat is the most cost-effective habitat to protect. The ability to restore degraded habitat back to its proper function is limited by our technical knowledge of the complex interactions associated with the different habitat types. Within WRIA 06, the vast majority of the salmon habitat has been impacted, at some level, by human activities. Habitats in need of protection within the sub-basins and along the coastal shoreline are those areas that still retain a significant portion of their original habitat functions or possess a high potential for restoration.

Lake Hancock is one the best examples in WRIA 06 of a coastal intertidal environment that still resembles the native ecosystem. It is now managed as a protected area by Whidbey NAS and The Nature Conservancy of Washington. In addition the Whidbey NAS owns and manages Crescent Bay Marsh which is in the process of being restored in a joint effort between Island County and the Navy. Swantown Marsh, and the Iverson Farm estuary are in Island County ownership both systems require restoration to

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1 reestablish them as functioning estuary systems. A few other coastal
2 wetlands are identified to be functioning relatively well under natural
3 processes but still existing in private ownership without formal protection.
4 They are Grasser's Lagoon, Harrington Lagoon, and Race Lagoon on
5 Whidbey Island and Triangle Cove on Camano Island.

6
7 Freshwater stream systems that still maintain a low level of development and
8 relatively healthy riparian corridors include Glendale, Cultus, North Bluff,
9 Chapman, and Deer Creeks. All of these streams have barriers to fish access
10 that need to be remedied, and will require some localized riparian and
11 channel restoration, but the existing hydrological condition is still relatively
12 unimpaired and the streamflows are presumed to be perennial and capable of
13 supporting salmonids throughout much of their length.

14 15 **Data Gaps**

16
17 Twenty data gaps were identified for the purpose of guiding future inventory
18 and research needs. The data gaps were identified in the WRIA 06-Limiting
19 Factors Report which was developed with the assistance of the WRIA 06:
20 Salmon Recovery Technical Advisory Group. High priority items include
21 related fish surveys, streamflow data, estuary and nearshore inventories, and
22 physical habitat surveys.

23
24 The land use and land ownership conditions in WRIA 06 present several
25 exciting opportunities for beneficial and relatively cost effective salmon
26 habitat restoration opportunities. This is particularly true for the larger
27 estuaries and saltmarshes in the nearshore environment. Feasibility studies
28 for high priority restoration projects are needed now to identify historical
29 conditions, design restoration options, and address social and economic
30 issues.

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Table 20. Data gaps in WRIA 06.

Relative Priority Data/Information Gap Source

High

- Systematic inventory of freshwater salmonid distribution and genetics
- Systematic inventory of marine salmonid distribution and genetics
- Nearshore, estuarine, salt marsh and lagoon habitat inventory and GIS map
- Use and importance of nearshore, estuarine, salt marsh and lagoon habitat by salmonids
- Riparian habitat inventory and GIS map production
- Completion of the physical habitat survey and GIS map production
- Completion of the culvert inventory and GIS map production
- Completion of the shoreline armoring inventory and GIS map production
- Identify high quality habitat for protection opportunities
- Install gages and monitor streamflows in known and potential fish-bearing streams
- Historic and current beaver activity in Maxwellton watershed in relation to salmon

Moderate

- History, extent and impact of invasive exotic species in riparian/aquatic habitats
- History of nearshore development
- Fecal coliform/nutrient sources in relation to Dissolved Oxygen in freshwater and marine habitats
- Importance of high intertidal beach environment to nutrient cycling
- Compile historical information on salmonid distributions and populations
- Analysis of processes occurring in estuarine, salt marsh and lagoons
- Survey boat ramps to identify obstructions to natural beach processes

Low

- Known and potential use of lakes by salmonids
- Field survey of unclassified creek systems per WDNR code

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Vision Statement

Vision: The WRIA 06 Salmon Recovery Working Teams and Salmon Technical Advisory Group, representing diverse partnerships between local, state and regional organizations, envisions a thriving salmon resource in the islands nearshore, estuaries and streams.

In order to achieve this vision we are:

- Working in tandem with existing regional, state and local salmon recovery efforts;
- Completing technical assessments to fill data gaps to more effectively target resources and efforts;
- Identifying and prioritize opportunities to protect existing habitat and restore habitat critical to salmon recovery and
- Improving our strategy as new data and information about our ecosystems is obtained through the assessments.

This strategy focuses on the prioritization of habitat protection and restoration projects. The Camano Island Salmon Recovery Working Team, Whidbey Island Salmon Recovery Working Team, and Salmon Technical Advisory Group were instrumental in the development of this strategy plan. This strategy plan provides the framework for the development of habitat protection and recovery efforts in Island County.

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Guiding Principals

Community Involvement: Community support for a project helps to pave the way to a smooth implementation of a project especially for large scale acquisition and restoration projects. Projects that clearly demonstrate community support tend to have a higher rate of successful completion. Early community outreach and involvement during project conception and initial project planning is highly encouraged. This strategy highly recommends that project sponsors build into their scope of work community outreach and involvement activities that keep the public in the loop and informed of the process.

Public Outreach and Education: Salmon recovery activities and projects are often very technical and complicated. Many of the restoration actions being proposed and implemented require alterations to the existing environment. There is often resistance to those actions that are not completely understood by the citizens in the neighborhoods where the work is being proposed. An informed and educated public that is kept aware of the process is more likely to support the project. Public forums, school programs, direct mailings and media coverage are some of the methods that are currently being employed to reach the general public and focus groups. To this end the strategy recommends that a strong public outreach and education program be developed for the WIRA 06-Salmon Recovery Program. Salmon Recovery project sponsors are highly encouraged to incorporate public outreach and education projects within their projects.

Public Participation: In order to achieve the goals of salmon recovery in WRIA 06, it is important to actively involve citizens in the planning and implement process. Participatory involvement by the Island County citizens is highly supported in both the efforts of the salmon recovery program and salmon recovery projects. To this end, this year (2001) two citizen salmon recovery working teams, one on each island were formed. This forum provides an opportunity for citizens to be actively involved in the development and implementation of the salmon strategy and in project scoping for salmon recovery efforts on their island. In addition, a number of the project sponsors are developing interactive citizen working teams to oversee and evaluate the salmon recovery options being recommended by the project. Volunteer involvement in studies and site monitoring are successfully being employed to more actively involve the public in the

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1 salmon recovery process. This strategy highly recommends this proactive
2 approach to public participation in the implementation of salmon recovery
3 projects.
4

5 **Landowner Partnerships:** Landowner support, cooperation and assistance
6 is required for the successful implementation of this strategy plan. This
7 strategy promotes the concept of developing a wide range of options for
8 working one-on-one with landowners to involve them actively in the process
9 of salmon recovery on the lands that they own and manage.
10

11 **Project Sponsor Support:** Successful salmon recovery projects require
12 dedicated and committed project sponsors that are capable of carrying a
13 project through from conception to implementation. The complexity of
14 many of the salmon recovery projects proposed in the Limiting Factors
15 Analysis are beyond the scope of many local organizations to manage alone.
16 The WRIA 06 Lead Entity staff, SRWT's and Salmon TAG will continue to
17 provide technical assistance and support to the project sponsors
18 implementing salmon recovery projects. Since project sponsor organizations
19 are currently limited on the islands, efforts have been initiated to expand the
20 capacity of existing organizations to take on projects and to cast the net
21 wider to bring in organizations outside the region to be project sponsors. In
22 order to continue the salmon recovery efforts in this region these efforts
23 need to be continued and expanded.
24

25 **Partnerships:** Well established and solid working partnerships are
26 paramount to successful project implementation. WRIA 06 Lead Entity
27 staff, SRWT's and Salmon TAG will continue and expand on its current
28 efforts to encourage partnership building, assist in the development of
29 project partnerships and in the maintenance of these interconnected
30 partnerships.
31

32 **Program Coordination:** Coordination and collaborative partnerships with
33 other water resource programs in the region is paramount to the success of
34 the Salmon Recovery program in WRIA 06-Island County. The Island
35 County Water Resource Advisory Committee (WRAC) has oversight for all
36 of the Island County water resource programs and the salmon recovery
37 program. The Lead Entity coordinator is an active participant on the
38 WRAC. Most of the active salmon recovery groups in Island County
39 participate on one of the two Salmon Recovery Working Teams. The Marine

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1 Resource Committee has a staff representative from the Island County
2 Salmon Recovery program involved in their process. The executive director
3 of the MRC is a representative for the Marine Straits Commission. The
4 Island County Lead Entity Coordinator is the Puget Sound Lead Entity
5 representative on the Puget Sound Nearshore Assessment Steering
6 Committee.

7
8 The Island County Salmon Recovery Program currently works closely with
9 the following local programs; 2514 Watershed Program, 400-12-Watershed
10 Non Point Pollution Program, Maxwellton Salmon Adventures, Snohomish
11 Conservation District, WSU Cooperative Extension-Beach Watcher & Weed
12 Control Program, Marine Resource Committee, IC Health Department
13 Groundwater Program, IC Planning and Community Development, IC Roads
14 Division and the IC Surface Water Division on issues related to salmon.
15 This strategy recommends that this coordination continue to be nurtured and
16 expanded to encompass other organizations involved in salmon recovery.

17
18 In addition to general coordination and technical assistance, the Salmon
19 Recovery Program has developed a series of collaborative partnerships for
20 the implementation of salmon recovery activities has been initiated. Some
21 examples of established partnerships and active salmon recovery programs
22 are included in the Appendix so that they can be updated annually.
23 Continued cultivation of the existing partnerships and future project
24 collaboration is highly encouraged. Expansion of these types of
25 collaborative efforts with other agencies and organizations is one of the
26 goals of the program. The tracking of local & regional salmon recovery
27 implementation activities and in process salmon recovery project planning is
28 a future goal of the salmon recovery program. Quarterly status reports will
29 be distributed to the Salmon Recovery Working Teams, the Salmon TAG,
30 the Water Resource Advisory Committee and other interested parties.

31
32 **Project/Activity Priorities:** The strategy strives to provide guidance in the
33 planning and implementation of actions that will produce the greatest benefit
34 to the salmonids populations in WRIA 06. In order to achieve this goal,
35 technical assessments and studies are necessary for effective salmon
36 recovery and implementation. High priority is placed on assessments that
37 will fill identified data gaps needed to establish ecosystem priorities, and
38 identify restoration projects. Feasibility studies and ecological restoration

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plans for estuary restoration projects have also been identified as a high priority because of the complexity of most of these projects.

Acquisition of estuaries identified with a high potential for restoration has been identified as a high priority. Majority ownership of these systems has been determined to be essential for future restoration activities being proposed for these sites. The reestablishment of tidal influence into closed estuaries is a restoration priority.

Priorities for nearshore and creek projects and activities are still being developed. The Marine Resource Committee has taken lead on developing priorities for the Nearshore Ecosystem and developing a series of project lists. Through the work being done under the SRFB Creek Inventory and Restoration Planning grant by the Maxwelton Salmon Adventures and the Snohomish Conservation District, priorities and prioritized projects lists will be established for the county's salmon supporting creeks. Priorities for county creek culvert replacements on the salmon supporting creek watersheds will be established as part of the work being done under a SRFB grant.

Program and Project Funding: Salmon Recovery in WIRA- 06 consists of a variety of programs managed by both the county and a series of non-profit organizations. In order to support this work and expand beyond the activities and projects currently being implemented a steady stable funding mechanism should be sought for both the county and nonprofit organizations programs. Until that funding source is obtained, it is recommended that a diversity of grant funds be sought to provide program funding. For project funding including studies and assessments, it is recommended that only large scale high cost projects be submitted for funding through the Salmon Recovery Funding Board Grant Program. Funding for these smaller projects should be sought through alternative funding sources such as the Fisheries Enhancement Task Force, Conservation Districts, and local businesses. Due to the complexity and high cost of some of the large scale projects proposed for the future, it is recommended that a variety of grant funding sources and local contributions be sought to fund these projects.

Monitoring and Adaptive Management: Monitoring and adaptive management are necessary components for any actions undertaken to protect and restore salmon. This strategy strongly encourages the inclusion of

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project monitoring and adaptive management components in all salmon recovery activities.

Ecosystem Priorities: WIRA 06-Island County has a diversity of ecosystems that support salmon. Through an analysis of the three major classifications of salmon ecosystem habitats in WIRA-06, it was determined that the nearshore habitat, estuarine habitat and creek systems were all important to the health of the Puget Sound. As a result of this finding, all three ecosystems are addressed in this strategy and project lists developed for each.

This portion of the strategy recognizes that the productive capacity of different ecosystems in WRIA 06 are not equal. Given the limited salmon recovery resources, both time and funding, a prioritization of the ecosystems was done to focus the salmon recovery efforts of the region. These ecosystems are divided into tiers based on their level of priority. Tier One is the highest level of priority, Tier two is the second level of priority and Tier Three is the lowest priority.

Nearshore

The rich resources of the nearshore environment support a large and diverse salmon and wildlife populations. They are especially critical as migratory corridors for both juvenile and adult salmonids. The nearshore priorities are being developed as part of nearshore assessments that is currently in process. The Marine Resource Committee is taking project lead on the work being done in the nearshore ecosystem. The nearshore ecosystem is listed as the highest priority. [Tier I]

Estuary

Estuaries provide an ideal area juvenile salmon development at both the fry and smolt stage. Some salmon species are heavily dependent on estuaries, particularly chinook, chum and to a lesser extent pinks. Returning adult salmon use the estuaries mainly for feeding. The Island County estuaries have increased in importance over time due to the loss of natal river estuaries. The shallow water lying between the major salmon producing rivers and the islands of Camano and Whidbey provides a migratory path for the juvenile salmon to access the estuaries here. The Island County Salmon Recovery Program is taking project lead on the work being done in the

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1 estuary ecosystems. The estuary ecosystems are listed as the second highest
2 priority. [Tier II]

4 **Creeks**

5 The creek systems in Island County are too small to support commercial
6 runs of salmon. They do however provide an important resource for salmon
7 recovery in the region through their accumulative contribution to the Puget
8 Sound food web. Work being done in the watersheds that support salmon is
9 also contributing significantly to the public awareness of the need for salmon
10 recovery in Island County and the importance of public involvement in the
11 recovery efforts. The Maxwellton Salmon Adventure is taking project lead
12 on the work being done in the Maxwellton and Glendale Creek watersheds
13 on Whidbey Island. The Snohomish Conservation District is taking project
14 lead work being done in Chapman and Kristoferson Creek watersheds on
15 Camano Island. The creek ecosystems are listed as the third priority. [Tier
16 III]

17
18 The list of ecosystems by Tiers has been separated out by island for use by
19 the Salmon Recovery Working Teams, project sponsors and citizens residing
20 on those islands.
21

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Whidbey Island Ecosystems by Tier

Tier 1: Nearshore-Bays, Coves, Harbors

Admiralty Bay (Crockett, Admiral)
Crescent Harbor (Crescent)
Cornet Bay (Deception, Cornet, Troxell, Hope)
Cultus Bay (Cultus, Hook)
Dugualla Bay (Dugualla)
Holmes Harbor (Holmes, Greenbank, Dines, Arcadia, Honeymoon, Holmes, Golf, Freeland, Eaton, Goss, Beverly, Rocky)
Mutiny Bay (Bluff, Mutiny Bay)
Oak Harbor (Oak Harbor, Crescent)
Penn Cove (Monroe, Penn, Hastie)
Useless Bay (Useless)
Other priority areas will be identified by the Marine Resource Committee through their Nearshore Assessment Project

Tier II :Estuaries

Estuaries with an Associated Creek
Crescent Saltmarsh & Crescent Creek (Crescent)
Cultus Estuary & Cultus Creek (Cultus)
Deer Lagoon & Lone Creek (Lone)
Dugualla estuary and Dugualla Creek (Dugualla)
Maxwelton estuary and Maxwelton Creek (Maxwelton)
Swantown Lake & Swantown Creek (Swantown)
Estuaries
Crockett Lake (Crockett)
Grasser Lagoon (Penn)
Lake Hancock (Hancock)
Harrington Lagoon
Kennedy Lagoon (Penn)
Race Lagoon (Race)

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Whidbey Island Ecosystems by Tier

Tier III: Creeks

Salmon Supporting Creeks

Glendale Creek (Glendale)

Maxwelton Creek (Maxwelton)

Cutthroat Trout Creeks with Potential for Salmon

Cultus Creek (Cultus)

Dugualla Creek (Dugualla)

North Bluff Creek (Houston)

Cutthroat Trout Creeks without the potential for Salmon

Deer Creek (Deer)

Old Clinton Creek (Brighton)

Creeks with Potential for Salmon

Lone Creek (Lone)

Crescent Creek (Crescent)

Swantown Creek (Swantown)

Creeks with Potential for Cutthroat

Brook Haven Creek (Langley)

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Camano Island Ecosystems by Tier

Tier 1: Nearshore-Bays, Coves, Harbors

Elger Bay (Park, Elger, O-Zi-Va)
English Boom (Boom)
Livingston Bay (Livingston)
Utsalady Bay (Brokaw, Arrowhead, Utsalady, Brown)
Other priority areas to identified by the Marine resource Committee through their Nearshore Assessment Project

Tier II: Estuaries

Estuaries with an Associated Creek

Triangle Cove and Kristoferson Creek (Triangle)

Estuaries

Elger Bay Salt Marsh (Elger)
Iverson Farm Estuary (Livingston)

Tier III: Creeks

Salmonid Supporting Creeks

Chapman Creek (Onamac)

Cutthroat Trout Creeks with Potential for Salmon

Cavalero Creek (Cavelero)

Cutthroat Trout Creeks

None known

Creeks with Potential for Salmon

Carp Creek (Carp)
Kristoferson Creek (Triangle)

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Specific Site Priorities: Within Island County's diversity of ecosystems that support salmon, there are distinctly different types of nearshore habitat, estuaries and creek systems. Although it is recognized that the sum of these distinctly separate systems all contribute to the health of the Puget Sound and support the fish populations, that they are not all equal in their contribution or potential.

Given the limited salmon recovery resources, a prioritization of the estuaries and creeks was done to focus the salmon recovery efforts of the region on the highest priority habitats. Within these two types of ecosystems, a set of criteria was developed by the Salmon TAG. The estuary criteria was used to priority rank nine of the highest priority estuaries. The Creek ranking criteria was used to rank all of the identified creek systems. This prioritization of individual systems was done based on priorities for all of WRIA 06-Island County. The ranking criteria used for the ranking of these systems is provided in the Appendix.

The ranking criteria for the nearshore habitats and projects is still in the process of being developed by the Marine Resource Committee. The Island County Salmon Recovery Program is in the process of investigating the potential for working in conjunction with Trout Unlimited to type and prioritize the creek drainages that are currently unclassified.

Estuaries: The estuaries with supportive creek systems tend to contribute the greatest amount of biodiversity for all the species of resident and anadromous fish populations. Estuaries that do not have an associated creek system provide important habitat but do not provide as much biomass and nutrients for the food web. The estuaries that are now blocked provide only minimum benefits to migratory salmonid in their existing condition. Their potential was determined based on their historical land area and the extend of the watershed supporting them.

The creeks were prioritized based on their fish supporting status or their potential for supporting salmonids based on the existing watershed conditions. The highest priority creeks are those that currently support salmon and cutthroat trout. The second priority are those that currently support cutthroat trout that have a potential for supporting salmon. The third priority are those creeks that currently are not supporting a known fish run but have the potential for supporting salmon runs.

Island County-WRIA 06 Salmon Strategy

Ranking of the Island County Estuaries for Salmon Restoration Efforts

Estuary Sites Priority Ranked

Ranking	Estuary Site
1	Deer Lagoon
2	Dugulla
3	Crescent
4	Triangle (Camano)
5	Cultus
6	Maxwelton
7	Swantown
8	Crockett
9	Iverson (Camano)

Estuaries Not Currently Ranked

<u>Whidbey Island</u>
Grasser Lagoon (Penn)
Lake Hancock (Hancock)
Harrington Lagoon
Kennedy Lagoon (Penn)
Race Lagoon (Race)
<u>Camano Island</u>
Arrowhead Point
Elger Bay Salt Marsh (Elger)
Livingston Bay Estuary

Island County-WRIA 06 Salmon Strategy

Ranking of the Island County Creeks for Salmon Restoration Efforts

Salmon Restoration

1. Maxwellton Creek
2. Glendale Creek
3. Chapman Creek
4. Dugulla Creek
5. Lone Creek
6. Kristoferson Creek
7. North Bluff Creek
8. Cultus Creek
9. Crescent Creek
10. Swantown Creek
11. Deer Creek
12. Carp Creek
13. Cavelero Creek

Cutthroat Trout restoration

14. Old Clinton Creek
15. Brookhaven Creek

Island County-WRIA 06 Salmon Strategy

1 **Ease of Implementation Site Prioritization:** A process has been started to
2 analyze all of the salmon recovery potential projects identified in this
3 strategy plan for ease of implementation or the “do-ability” of the project.
4 The criteria for this analysis have not yet been developed. It is anticipated
5 that this analysis will re-order the priority list for implementation based on
6 realistic achievable goals. Strategy plans can then be developed for the more
7 challenging projects so that they can be completed over a longer period of
8 time.
9

10 **Conclusion:** This strategy tries to recognize that different groups and
11 agencies have different agendas and desires. Using an overall strategy can
12 help to put those different actions into a larger perspective. The strategy can
13 assist with balancing efforts to make sure that areas of prime importance are
14 not ignored or missed or duplicated because of lack of coordination among
15 the groups working on salmon recovery through a variety of funding
16 sources.
17

Island County-WRIA 06 Salmon Strategy

Project Lists: Through the work completed as part of the development of the Limiting Factors Analysis for WRIA 06-Island County (April 2000) a project list and data gaps for all the identified ecosystems was developed. The Island County Salmon Recovery Program expanded on these efforts through the development of the Estuarine Restoration Program (Shelton & Associates, Inc June 2001). The Marine Resource Committee is in the process of developing a more expansive list of habitats and projects through their nearshore assessment work. The Maxwelton Salmon Adventures and the Snohomish Conservation District are in the process of developing creek restoration plans which will expand the project list for the three salmon supporting creek systems (Maxwelton, Glendale and Chapman).

The project lists have been separated out by island for use by the Salmon Recovery Working Teams, project sponsors and citizens residing on those islands. The projects proposed within these lists are based solely on the identified needs of the salmon species slated for recovery efforts. Factors such as the cost vs potential impact consideration or political and community support have not yet been figured into this process. The Whidbey Salmon Recovery Working Team has established a goal for 2002 to do an Ease of Implementation Analysis on all of the identified projects on Whidbey Island. Upon completion of that project their recommendations for implementation priorities will be incorporated into this strategy plan. The actual implementation of all of the actions recommended will be dependant on willing landowners of the estuary, nearshore or creek sites identified.

Editorial Note:

In the following section, I attempted to put the projects in alphabetical order. Unfortunately, I also wanted to link the estuary with the associated creek but since they are not always the same it's confusing at times. I plan to put the descriptions in order from North to South in the final document unless someone else can come up with another recommendation which is more logical. All the summaries are now listed in the table of contents if you wish to quick reference a particular salmon recovery site.

Island County-WRIA 06 Salmon Strategy

1
2
3
4
5
6
7

Salmon Recovery Site Project Descriptions

Island County-WRIA 06 Salmon Strategy

Whidbey Island Project Lists

Brookhaven Creek (Langley)

Brookhaven Creek is in the Langley watershed (5 km²) located in the vicinity of the town of Langley on the eastern shore of Whidbey Island. The watershed drains in a northeast direction into Saratoga Pass. The outfall to this creek is perched at the seawall reducing any potential for the reintroduction of anadromous fish without extensive restoration efforts. The creek channel is fairly stable throughout most of its upper and middle reach. Residential development has impacted the lower reach which weaves its way down through the city of Langley. This watershed is noted mainly because of its potential for restoration for residential Cutthroat trout. The Langley school district has been conducted a limited amount of creek restoration work on the section of creek that abuts their property.

Goals for restoration:

- ◆ Protection and restoration of creek for residential cutthroat trout and potentially anadromous salmonids.

Project List

- Investigate options for providing fish passage at the sea wall. If fish passage is obtainable, develop an action plan for restoring and managing Brookhaven Creek for anadromous salmonids. If fish passage is not a cost effective option, develop an action plan for restoring and managing the creek system for Cutthroat trout.
- Identify and protect the headwaters of Brookhaven Creek through acquisition or conservation easements.
- Reconstruct and revegetate the Brookhaven stream channel in the vicinity of the sports field at the Langley Middle School.
- Provide protection for the riparian buffer through acquisition or conservation easements, and investigate partnerships with local landowners for riparian restoration projects.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

Island County-WRIA 06 Salmon Strategy

Crescent Harbor Marsh

Crescent Harbor Marsh is located on the Seaplane Base of Naval Air Station, Whidbey Island, and is owned and managed by the U.S. Navy. The marsh is about 150 acres in size, and lies to the north of Crescent Harbor, on the east shore of north Whidbey Island, to the east of the town of Oak Harbor. Presumed to have once been all saltmarsh, there is now a beach berm and tidegate that limit tidal action in this wetland. It is believed to be only 30 percent saltmarsh now, with a larger component of freshwater marsh and small areas of scrub-shrub and forested wetland. The tidegate was propped open permanently in 1994 in an effort to restore more saltmarsh. The tidegate is believed to still be at least a partial if not total blockage for salmonids. Ditching within the marsh is prevalent, and a large sewage treatment lagoon (still actively operated) is located in the middle of the marsh. The ditches and berms in the marsh act to restrict the extent of saltwater influence. The buffer has only been marginally impacted by a road along the south edge of the marsh, and by clearing along the north edge. Crescent Creek enters the marsh at its north end. There are possible fish blockages along this creek. Crescent Harbor Marsh provides valuable nesting habitat for northern harriers and for waterfowl.

The goals that have been established for restoration of Crescent Harbor Marsh and Crescent Creek include:

1. Restore saltwater flow to greater portion of marsh
2. Restore salmonid access to greater portion of estuary and Crescent Creek
3. Enhance wildlife habitat

Major actions are

- replace tidegate with open channel and install conspan or bridge Pioneer Way
- explore options for eventually closing and removing Pioneer Way
- remove existing dikes, berms and ditches within estuary to allow for distribution of flows
- excavate distributary channels off of main channel
- explore options for creating additional open channel between bay and marsh
- fill the ditch that parallels Pioneer Way

Island County-WRIA 06 Salmon Strategy

- explore with the Navy and City of Oak Harbor the feasibility of eventual removal of sewage lagoon and restoration of that area
- create new interpretive sign to explain purpose of project
- monitor changes in marsh vegetation, salinity, water levels, and salmon and wildlife use
- develop a plan to restore and manage Crescent Creek for the reintroduction of salmon
- provide protection for the riparian buffer of Crescent Creek through acquisition or conservation easements

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey and hydraulic analysis to determine extent of flooding in vicinity of sewage lagoon, and evaluate what measures may be needed to protect lagoon embankment from erosion
2. Conduct study of currents in Crescent Harbor to determine best angle and width for outlet channel
3. Conduct water quality study to determine how presence of sewage lagoon is impacting the wetland
4. Collect streamflow data and evaluate potential spawning habitat in Crescent Creek to determine benefits of improving passage into creek

Island County-WRIA 06 Salmon Strategy

Crescent Creek (Crescent)

The Crescent watershed (30.7 km²) is located in the northeastern corner of Whidbey Island. This watershed is the second largest in WRIA 06-Island County with the longest shoreline length (19.3 km) of any watershed in Island County. The creek is not currently classified as fish supporting however anecdotal information suggests that salmon were historically present in the creek and marsh. Crescent Creek drains this watershed from its headwaters in the vicinity of Fakkema Road and the Sleeper Road wetlands. The creek has been ditched and channelized throughout much of its length. In a few instances the creek has been diverted directly into county ditches. Most of the riparian vegetation associated with the creek has been altered. The creek drains south to Crescent Marsh and then into Crescent Harbor. In the early 1910s the marsh was first ditched for agricultural purposes. The marsh was then extensively diked and ditched in the 1930's. The tidegate was permanently opened in 1994 to reestablish tidal influence and reestablish fish passage to the marsh system. The Navy and Island County are currently in the process of restoring the marsh and reestablishing tidal conductivity through the removal of the tidegate.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Develop a plan to restore and manage Crescent Creek for the reintroduction of anadromous salmon.
- Explore the possibility of moving the left creek tributary that drains from the Sleeper Road wetlands to the county drainage ditch and unmaintained agricultural channels.
- Identify and protect (through acquisition or easement) the headwaters of Crescent Creek.
- Provide protection for the riparian buffer through acquisition or conservation easements.
- Identify and protect the headwaters of the stream.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

Island County-WRIA 06 Salmon Strategy

Crockett Lake

Crockett Lake is a very large wetland system, roughly 600-700 acres in size, that is located on Admiralty Bay on the west side of Whidbey Island, just south of the Coupeville area. This area was once an extensive saltmarsh that was closed off from open tidal flushing when the existing berm was constructed for a road to service Fort Casey. Saltwater currently enters the marsh via a culvert and tide gate that is located near the Keystone ferry terminal. Although the wetland does not have open tidal flushing, it is about 60 percent brackish marsh with smaller areas of freshwater marsh and mudflats. No freshwater streams enter this wetland. Fish access to the marsh is blocked by the existing tidegate, which is no longer functioning. Ditches were excavated in the eastern portions of the wetland to provide a hydrologic connection between the wetland sections on either side of Wanamaker Road. Wetland buffers are impacted by roads, and several small commercial buildings, as well as ferry terminal parking.

The goals that have been established for restoration of Crockett Lake include:

1. Establish open exchange of saltwater between Crockett Lake and Admiralty Bay
2. Restore salmonid access to marsh and enhance wildlife habitat

Major actions are:

- acquire privately owned parcels as they become available
- enter into cooperative agreements with other public land owners to restore marsh
- conduct study of hydrologic assessment of effects in marsh of creating openings
- remove tide gate and install conspan or bridge
- explore alternative location for opening a channel near the state park ponds at east end of lake and span opening for road
- fill in ditches in wetland and allow tidal channels to form
- install interpretive area on berm

Island County-WRIA 06 Salmon Strategy

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey of marsh
2. Conduct hydraulic analysis of Admiralty Bay and marsh to determine extent of area that could potentially be flooded following beach berm breaching and to determine best locations for open channels
3. Determine what properties may need protection from flooding and explore acquisition or creating protective structures
4. Research tidegate and vegetation records to determine how marsh has changed since tidegate stopped functioning
5. Approach all public owners of site to begin to develop partnership and funding sources for marsh restoration
6. Conduct water quality study to determine how surrounding development has impacted marsh and to evaluate need for source control measures passage at various culverts in the system

Island County-WRIA 06 Salmon Strategy

Cultus Bay

Located at the southeast tip of Whidbey Island, Cultus Bay is one of the largest estuarine systems in Island County. This site is among the top five priority estuaries for restoration in Island County. Freshwater marsh, scrub-shrub wetland, saltmarsh, mudflats and shallow open water total over 650 acres in size. Cultus Creek drains to the west end of the marsh and provides the main freshwater source. A large area that was historically saltmarsh has been diked off from open tidal exchange, with a small culvert and tidegate allowing minimal exchange of saltwater. Active grazing occurs in the higher elevations of this area behind the dike. A house is located on the existing beach berm, with the dike road being the only access to this house. Along the east side of the bay is the Sandy Hook residential community, a dense collection of houses on a north-trending spit jutting into the bay. The bay shoreline has been significantly modified in this area. Cultus Creek is a salmon-bearing stream, but the tidegate at the dike significantly impedes fish access to the creek. Known upstream barriers to fish passage include an existing culvert at Bailey Road and an earthen dam on private property just upstream from Bailey Road.

The goals that have been established for restoration of Cultus Bay and Cultus Creek include:

1. Restore diked area to saltmarsh with open tidal flushing
2. Open up diked area for salmonid rearing and improving fish access to Cultus Creek
3. Provide long-term protection for high value estuary

Major actions are:

Phase 1:

- acquire or gain easement to dike in vicinity of tide gate and to areas that will be flooded as result of breaching dike
- remove tide gate and culvert, create 20 foot wide channel and span with conspan
- repair culvert at Bailey Road and remove earthen dam

Phase 2:

- acquire or gain conservation easement to entire wetland
- create wider opening in dike and build bridge to span
- acquire/gain conservation easement for stream riparian buffer and implement restoration program in cooperation with landowners
- implement vegetation monitoring program for estuary

Island County-WRIA 06 Salmon Strategy

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey of area behind dike
2. Conduct hydraulic analysis to determine extent of area behind dike that could potentially be flooded following dike breaching; determine whether existing house on beach berm will need protection from flooding
3. Conduct bay circulation study to determine best location for new channel opening
4. Conduct water quality study to determine how ongoing livestock grazing is affecting the wetland and whether Sandy Hook septic systems are affecting water quality
5. Collect streamflow data and study existing salmonid use of Cultus Creek, including details on existing habitat availability and quality to determine benefits of improving passage at various culverts in the system

Island County-WRIA 06 Salmon Strategy

Cultus Creek (Cultus)

The Cultus Creek watershed (8.0 km²) is located at the southeast tip of Whidbey Island. The Creek flows south into a wetland system, and then into Cultus Bay. The headwaters of the stream are derived from hillside springs. Wetland systems, like those found downstream of Bailey Road, are also presumed to contribute base flow to the stream. The riparian corridor above the estuary is in relatively good condition with some impact from historical logging practices and residential development in the watershed. The shoreline length of Cultus Bay is estimated to be 2.4 km. The current fish usage is resident Cutthroat trout but the and creek system has the potential to support small runs of anadromous fish. The culverts that have been installed on both sides of Bailey Road also impede fish passage. Upstream of Bailey Road, is a constructed earthen dam. Water from upstream drainage flows through a perched pipe in the dam.

Fish passage is partially or wholly blocked to Cultus Creek by a tidegate at the north end of the dike. The channels in the vicinity of the wetland were dredged in 1999. The estuary has invasive exotic plant species.

The shoreline along Sandy Hook has been heavily modified by residential development and groins. A private harbor has also been constructed east of the sand spit. Coho are reportedly being raised in net pens in the vicinity of Sandy Hook.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Island County-WRIA 06 Salmon Strategy

Cultus Creek (Cultus)

Project list

- Develop a plan to restore and manage Cultus Creek for Residential cutthroat and the reintroduction of anadromous salmonids.
- Repair the existing culverts on Bailey Road.
- Remove the private dam above Bailey Road.
- Identify and protect the headwaters of Cultus Creek.
- Provide protection of the riparian stream buffer through acquisition or easement, and explore cooperative restoration partnerships with local landowners.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

Island County-WRIA 06 Salmon Strategy

Deer Creek

The Deer Creek watershed (10.6 km² drains east from its headwaters at Deer Lake into Possession Sound and has 5.4 km of shoreline. The fish usage of this creek system is resident Cutthroat trout. The headwaters of the stream are formed by Deer Lake and hillside springs. The channel conditions are in relatively good condition except for the lowermost reach where the stream has been diverted into an underground flume and riparian vegetation is absent. The Deer Creek riparian corridor is relatively intact throughout most of its length. There have been some limited impacts from historic logging practices and residential development. Exotic plant species are present in the riparian corridor where land use modification has occurred. Access is the major habitat factor limiting salmonid use of Deer Creek. The mouth of the stream is funneled through a 46-cm culvert underneath Columbia Beach Drive and then across a private parcel into a 53-cm, 56-m long flume. The perched flume discharges from the top of the seawall onto Columbia Beach. Upstream, the Anderson Road Dam blocks all fish passage. If these two barriers were corrected, fish use could potentially extend to Deer Lake.

Deer Lake sits about 107 m above sea level. The lake is 0.4 km² in size, and about 15 m deep. The 2.7 km shoreline is mainly used for residential purposes. Approximately two-thirds of the shoreline is lined with grass lawns, and there are several bulkheads. The remaining riparian area contains alder, willow and rushes. The Washington Department of Fish and Wildlife stocks the lake with rainbow trout and cutthroat trout. The impact of stocked trout in Deer Lake is unknown.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Island County-WRIA 06 Salmon Strategy

Deer Creek

Project list

- Acquire the property upon which the flume is sited. Remove the flume and perched culvert at Columbia Beach to re-establish the stream channel at the mouth of the creek.
- Provide for fish passage at Anderson Dam.
- Remove exotic vegetation where present and revegetate the riparian corridor.
- Identify and protect (through acquisition or easement) the headwaters of Deer Creek.
- If fish passage is obtainable, develop a plan to restore and manage Deer Creek for coastal cutthroat and anadromous salmon.
- Provide protection for the riparian buffer through acquisition or conservation easements, and develop partnerships with landowners for riparian restoration projects.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

Island County-WRIA 06 Salmon Strategy

Dugualla Lake

Dugualla Lake is located on the east shore of north Whidbey Island, to the east of Ault Field, adjacent to Skagit Bay. This was once a very large saltmarsh system that has been reduced in size due to diking, artificial control of water levels, and ditching. Currently, water levels in the lake are maintained by pumping water to Dugualla Bay through the dike via a culvert. The marsh is now predominately open water and freshwater marsh; there is little evidence of saltmarsh influence inside the dike. Buffers have been disturbed by clearing of vegetation for use as farmland and by construction of houses and roads. Access to anadromous salmonids is blocked by the non-functioning tidegates and pumping system. Dugualla Lake is fed by Dugualla Creek, which crosses Navy land on Ault Field. Dugualla Lake is among the top five priority sites for estuarine restoration in Island County due to its potential size, the presence of a good-size creek, and its proximity to salmon entering the Skagit River.

The goals that have been established for restoration of Dugualla Lake and Dugualla Creek include:

1. Reestablish open, naturally maintained saltwater connection to system
2. Restore system to high quality saltmarsh
3. Provide salmonid access to Dugualla Creek and saltmarsh system
4. Provide educational & recreational opportunities

Major actions are:

- raise SR 20 above highest potential level of flooding that could result from project acquire or enter into conservation easement agreements for areas that will be flooded as result of project
- close Dugualla Road and re-route powerlines that parallel road
- remove dike, road, pumping station, tidegates, culverts and create open channel between Dugualla Bay and Dugualla Lake
- develop and implement restoration plan for Dugualla Creek and its riparian zone
- plant wetland buffers with native species

Island County-WRIA 06 Salmon Strategy

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey of area behind dike
2. Conduct hydraulic analysis to determine extent of area behind dike that could potentially be flooded following dike breaching; determine how much SR 20 will need to be raised and whether any other existing structures will need protection from flooding
3. Conduct study of circulation patterns in Dugualla Bay to determine best location, width and angle for channel
4. Conduct water quality study in wetland to determine how livestock grazing and farming practices have affected the wetland, and study upstream locations along Dugualla Creek to determine how practices on Ault Field have affected water quality
5. Conduct study of sediments in Dugualla Lake to determine what contaminants may be released to Dugualla Bay following dike breaching
6. Collect streamflow data and assess potential salmon habitat in Dugualla Creek to determine restoration needs for creek
7. Approach Washington Dept. of Transportation and Navy to determine support for and willingness to participate in project

Island County-WRIA 06 Salmon Strategy

Dugualla Creek

Dugualla watershed is the fifth largest in WRIA 6. The 18.3 km² drainage is located on the northeast side of Whidbey Island and drains to Dugualla Bay. The headwaters are presumed to be hillside springs. Dugualla Creek originates east of Ault Field and flows northeast to Dugualla Lake, which is located near the mouth of the stream. Water is pumped from the lake over a berm and into Dugualla Bay. The bay has 3.5 km of shoreline. This creek system has resident Cutthroat trout. The Dugualla Creek riparian corridor has been highly modified by dredging and channelization. No data has been collected on upstream riparian conditions, but it is believed to have been modified by residential development and military operations.

The Dugualla estuary known as Dugualla Lake is located east of Ault Field, and receives surface runoff from the naval installation. Dugualla Lake was historically one of the largest estuarine systems in WRIA 6, extending west of what is now State Route 20. It has been heavily modified, but has high potential for restoration. Riparian vegetation is totally absent from the estuary as the site is currently being farmed. A tide gate, owned by Whidbey NAS, controls the flow from the estuary. Access is the major habitat factor limiting salmonid use of Dugualla Creek. The tidegate prevents fish passage.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Island County-WRIA 06 Salmon Strategy

Dugualla Creek

Project list

- Conduct a feasibility study on the restoration of the Dugualla stream
- Identify and protect the headwaters of Dugualla Creek.
- If fish passage is obtainable, develop a plan to restore and manage Dugualla Creek for coastal cutthroat and anadromous salmonids.
- Provide protection for the riparian buffer, and initiate partnerships with local landowners to conduct riparian restoration projects.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

Island County-WRIA 06 Salmon Strategy

Glendale Creek

The Glendale watershed 7.2 km² is located at the southeast corner of Whidbey Island. Glendale Creek, one of the three most significant fish-bearing creeks in WRIA 6, flows in a southeast direction before draining into Possession Sound. The lower and upper portions of Glendale Creek support resident cutthroat trout. Chum and coho have been using the lower portion of the stream since the winter of 1996-97, when the culvert near the mouth of a stream was destroyed. The creek's headwaters begin from wetlands near Cultus Bay Road at an elevation of about 88 m and from hillside springs. From the headwaters the stream flows southeast through a narrow forested valley. The lower 183 m of the creek parallels Glendale Road and discharges into Possession Sound at the community of Glendale. Upstream of Glendale Road, the creek is less confined and further from the road. The creek is presumed to be perennial throughout its length. There is some concern that private water systems may be contributing to low flows in the creek

Much of the upper portion of Glendale Creek possesses very good or excellent habitat. The steep gradient of the Glendale Creek drainage has limited human impact to the riparian buffer adjacent to the creek. There is evidence that past logging practices have converted the native vegetation to a relatively young forest dominated by red alder and salmon berry. Today only a few conifers exist and they are mostly located on the upper slopes of the canyon at a distance too far to contribute large woody debris to the stream system. Exotic plant species are present where land use modification has occurred. The riparian area along the lower portion of the stream consists of residential lawns, invasive exotic species and pavement.

Land use in the headwaters of Glendale Creek has created erosion and sedimentation problems that could prevent salmon eggs in downstream redds from hatching. The soils in Glendale Canyon are naturally prone to erosion that can cause further impacts to the stream channel. The channels in the upper watershed are stable and support extensive wetland systems. Access is the major factor limiting fish production in Glendale Creek. A series of fish passage problems on both private and public property have been identified. In addition to culvert fish barriers, there are two dam structures located in the upper portion of the drainage.

Island County-WRIA 06 Salmon Strategy

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Develop a plan to restore and manage Glendale Creek for resident cutthroat and anadromous salmonids.
- Replace the Holst/Glendale culvert with a fish passage culvert.
- Modify or remove the existing dams to allow for fish passage.
- Identify and protect the headwaters of Glendale Creek.
- Encourage private landowners to replace culverts that pose fish passage problems.
- Provide protection for the riparian buffer through acquisition or easements, and for partnerships with local landowners to conduct riparian restoration projects.
- Replace a failing private drainage system on the left lower tributary to minimize impacts to hillside seepage.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

Completed projects

- Replace the deteriorating outfall that drains to Possession Sound.
Construct a fish passage channel through the Glendale community and revegetate the riparian buffer with native vegetation.
- Replace the temporary culvert at Humphrey Road with an arched culvert.
- Replace the culvert at the lower section of Glendale Road to allow for fish passage.
- Remove the illegal dumpsite in the canyon.

Island County-WRIA 06 Salmon Strategy

Grasser's Lagoon

Grasser' Lagoon is a moderate-sized marsh of about 40 acres that is located in the northwest corner of Penn Cove, on the east shore of central Whidbey Island, to the northwest of Coupeville. It lies just north of Kennedy Lagoon. Grasser's Lagoon is a relatively undisturbed embayment with high quality fish and wildlife habitat. It includes an open water lagoon, mudflats covered with algae, fringing saltmarsh, and a beach berm. The primary disturbances include location of SR 20 directly adjacent to the west and north edges of the lagoon, and clearing of shrub vegetation from portions of the buffer. No invasive species were observed in the lagoon. Existing salmonid use is unknown, but Grasser's Lagoon is presumed to be good habitat for juvenile rearing and feeding. It is very good waterfowl and shorebird habitat as well.

The goals that have been established for protecting Grasser's Lagoon and restoring the buffer include:

1. Provide long-term protection for high value coastal lagoon
2. Provide educational opportunity and limited access for public use
3. Enhance wetland buffer

Major actions are:

- purchase lagoon or enter into conservation easements with local landowners
- enhance existing pullout at northeast corner for public parking and post interpretive signs about lagoon
- enhance buffer by planting native species along north and west sides of wetland
- explore option to purchase 2.2 acre property currently for sale to north of lagoon and create park or open space for enjoying lagoon

Prior to implementing any of the actions listed above, the following information will need to be collected:

1. Water quality data on heavy metal input from SR 20
2. Approach local landowners to determine willingness to participate in protecting lagoon and enhancing buffer

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Lake Hancock

Lake Hancock is one of only ten known occurrences of high quality, high salinity lagoons in the Puget Trough. It is listed on the Washington Register of Natural Areas as a high quality wetland/aquatic ecosystem and is included in this program primarily as a reference site for estuarine restoration at other sites in Island County.

Lake Hancock is located on the west side of Whidbey Island to the west of the Greenbank area. It is owned and managed by the U.S. Navy and is considered part of the Naval Air Station, Whidbey Island. The wetland on this site is roughly 200 acres in size and includes emergent saltmarsh, lagoon, mudflats, freshwater marsh, forested bog, and scrub-shrub wetland. Historic topographic maps indicate this was once saltmarsh that eventually closed off with beach berm development. Farmed through the early 1900s, large storms breached the beach berm and allowed the wetland to transition to saltmarsh. Some farm ditches remain on the site. Acquiring the site in the 1940s, the Navy used it for practice target bombing, and it is now off limits to human access due to the risk of unexploded ordnance.

The goals that have been established for including Lake Hancock in this program are:

1. Continue protecting valuable estuarine system
2. Establish Lake Hancock as reference/control site for saltmarsh restoration at other locations throughout Island County

Major actions are:

- develop and implement vegetation monitoring plan with cooperation of U.S. Navy
- develop and implement salmonid monitoring plan with cooperation of U.S. Navy to determine fish use, distribution, species present, etc.

Prior to implementing any of the actions listed above, the following information will need to be collected:

1. The extent of access that will be allowed by the Navy for conducting studies on the site
2. The potential risk of various activities relative to unexploded ordnance (e.g., seining in lagoon)
3. Any long-term management plans the Navy has for the site

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Harrington Lagoon

Harrington Lagoon is located on east shore of central Whidbey Island, east of Smith Prairie, southeast of Coupeville, and north of Race Lagoon. At about 12 acres, it is one of the smaller estuaries included for consideration in this program. This estuary includes an open water lagoon, mudflats and a small amount of fringing saltmarsh. The lagoon is connected to Saratoga Passage by a narrow channel that appears to be blocked by a developing beach berm at lower tides. The outlet channel has been relocated from the north end of the lagoon, and it is questionable whether it is sustainable without dredging, given existing patterns of currents and beach berm development. The buffer of this lagoon is highly developed with houses and roads on both the north and south sand spit, and an arterial road along the west edge of the lagoon. Judging from old topographic maps, it is possible that a portion of the north end of the historic marsh was filled for residential development. A portion of the southeast shoreline of the lagoon has been armored as well. It is possible that the lagoon receives fecal coliform contamination from leaching septic drainfields, given location of drainfields in sandy soils. There are no streams that enter this lagoon.

The goals that have been established for protection and restoration of Harrington Lagoon include:

1. Provide long-term protection for lagoon
2. Improve water quality
3. Maintain/improve fish access to lagoon

Major actions are:

- enter into conservation easements with local landowners to protect beach berm and lagoon
- develop adopt-a-lagoon program with local landowners to educate residents regarding impacts of landscaping and leaching septic systems, and to develop revegetation plans for shoreline conduct study to determine changes in the channel configuration and sediment movement in relation to past shoreline development and explore ways to establish permanent open channel
- explore alternatives for armoring along southeast shoreline

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1 Prior to developing more detailed plans and applying for environmental
2 permits, a variety of data and background information will need to be
3 collected. The preliminary tasks that would need to be performed to collect
4 this information include:

- 5 1. Conduct water quality study to determine how landscaping practices
6 and septic systems may be impacting marsh
- 7 2. Contact homeowners association to determine willingness to work
8 with Island County to develop protection measures for lagoon
- 9 3. Research historic aerial photos to evaluate changes in outlet
10 configuration, and approach homeowners association for information
11 on actions they have taken to maintain the outlet channel
- 12 4. Conduct hydraulic analysis of lagoon and offshore currents to
13 determine influences on sediment movement in channel
14
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Kennedy Lagoon

Kennedy Lagoon is located at the west end of Penn Cove, on the east shoreline of Whidbey Island, to the northwest of Coupeville. It is a small lagoon with about 18 acres of wetland, comprised mostly of open water, with a small percentage of mudflats and narrow fringing saltmarsh. Eelgrass beds were noted within the lagoon. Kennedy Lagoon was once an open embayment with more extensive saltmarsh than remain today. The lagoon was apparently diked and a tidegate installed to control saltwater exchange. The tidegate is a vertical series of boards with a slat opening that maintains a constant water level in the lagoon. This structure appears to impede fish passage into the lagoon, but salmonid use is unknown. Houses surround the lagoon, with an arterial road on the dike/berm. Buffer vegetation has been cleared on some parcels, with mowed lawn extending to the shoreline. Some parcels have forested vegetation remaining. Shoreline armoring is extensive in northern part of lagoon. There are no streams associated with this lagoon.

The goals that have been established for protection and restoration of Kennedy Lagoon include:

1. Provide long-term protection for estuary
 2. Provide fish access and restore tidaly flushing to lagoon
 3. Restore shoreline of lagoon
- Major actions are:
 - remove tide gate and culvert, create 20 foot wide channel and span with conspan or bridge
 - acquire or gain conservation easement with landowners around lagoon to protect and restore shoreline
 - develop adopt-a-lagoon program with local landowners to educate regarding value of native vegetation and impacts of landscaping, and to develop plans for vegetation restoration
 - develop conceptual planting plans and program to provide plant material to homeowners
 - plant native species along road right-of-way
 - work with landowners to remove armoring and reshape portions of shoreline

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be

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collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey of area behind dike to determine likely extent of flooding
2. Conduct hydraulic analysis to assess impacts of opening lagoon to full tidal inundation
3. Conduct bay circulation study to determine best location and angle for new channel opening
4. Conduct water quality study to determine whether septic systems are affecting lagoon
5. Conduct study to determine possible impacts to eelgrass growing in lagoon following breaching of dike
6. Study existing salmonid use of Kennedy Lagoon to determine how to best enhance access to and habitat in lagoon

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Deer Lagoon

Deer Lagoon is the largest estuarine system on Whidbey Island, and ranks among the top five priority estuaries in Island County for restoration. It is located at the north end of Useless Bay in the southwest portion of Whidbey Island. Totalling around 950 acres, this site includes extensive freshwater marsh, an open water lagoon, mudflats, a small percentage of saltmarsh, and a stream system. The open water lagoon is roughly central to the site, with extensive emergent marsh on either side of the lagoon. Dikes have been constructed on both the east and west ends of the lagoon. There is a tidegate at the north end of the west dike (actually two parallel dikes), and water behind the east dike is actively pumped out into the lagoon. Other disturbances to the system include ditching, dredging, shoreline armoring, and residential development on the beach berm. The tidegate blocks salmonid access to the marsh on the west portion of the site, and the east dike blocks fish access to Lone Creek. Lone Creek has been ditched and much of its riparian vegetation removed.

The goals that have been established for restoration of Deer Lagoon and Lone Creek include:

1. Restore areas behind dike to saltmarsh with open tidal flushing
2. Restore salmonid access to saltmarsh and Lone Creek

Major actions are:

- acquire or gain conservation easement for dikes and wetland area behind dikes that may receive tidal inundation
- remove westernmost of double dike and break openings in easternmost of double dike, spanning the openings with conspans or bridges
- allow tidal channels to form in west marsh
- build soldier pile wall along north edge of beach berm in both east and west halves of site to protect houses from flooding
- acquire or gain conservation easement for riparian area of Lone Creek and development restoration plan for riparian vegetation with local landowners
- break opening in east dike and restore ditched Lone Creek to meandering channel

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- remove standpipe outlet at Lone Lake and restore outlet connection to Lone Creek
- restore lagoon shoreline by removing armoring and planting banks
- restore and manage stream system for coastal cutthroat and anadromous salmonids
- develop monitoring and management plan for Spartina

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey of area behind dikes
2. Conduct hydraulic analysis to determine extent of area behind dike that could potentially be flooded following dike breaching and to determine best locations for dike breaches
3. Conduct study of bay circulation patterns both in Deer Lagoon and Useless Bay to determine implications for dike breaches and marshes
4. Collect streamflow data and study existing salmonid use of Deer Lagoon and Lone Creek including details on existing habitat availability and quality
5. Conduct study of existing Spartina occurrence and control efforts to determine extent of problem

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Lone Creek (Useless)

The Useless watershed is located on the southwest side of south Whidbey Island. It is the third largest watershed in WRIA 6-Island County covering 30.5 km² and includes 11.4 km of shoreline. Lone Creek flows in a southerly direction from the headwaters north of Lone Lake into Deer Lagoon and then into Useless Bay. Lone Lake is about 5.2 m above sea level and is fed by two small inlets. The lake is 41 ha in size and 5.2 m deep. The standpipe culvert at the outlet of Lone Lake can prevent fish from entering and using the waterbody as rearing habitat. The Washington Department of Fish and Wildlife stocks the Lone Lake with rainbow trout.

Prior to human development, Deer Lagoon was one of the largest estuaries in WRIA 6. This area has been diked, ditched and dredged. Water from Lone Creek is pumped across the east dike at the northeast corner of the lagoon. The dike that runs north along the east side of the lagoon blocks the connection to Lone Creek and potential salt marsh habitat.

Lone Creek has been ditched and channelized throughout much of its extent. The upper watershed above the lake appears to be a mature forest although impacts from residential development are beginning to impact this area. The stream's riparian area has few natural vegetative buffers. There are a few short sections with relatively undisturbed areas that are dominated by immature forest/shrub stands. Invasive plants are present in most of the creek system.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

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Project list

- Acquire the pasture area east of the lagoon to restore the connection between the lagoon and Lone Creek.
- Reconfigure the reach of Lone Creek that flows into the east side of Deer Lagoon. Restore and revegetate the riparian buffer.
- Remove the standpipe culvert at the outlet of Lone Lake and re-establish the natural stream channel.
- Provide protection for the riparian buffer through acquisition or conservation easements, and initiate partnerships with local landowners to conduct riparian restoration projects.
- Identify and protect the headwaters of Lone Creek.
- Inventory the creeks system. Develop a plan to restore and manage the stream system for the reestablishment of coastal cutthroat and anadromous salmon

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

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Maxwelton Estuary

The Maxwelton estuary is located in the southwest portion of Whidbey Island, in the town of Maxwelton. The estuary includes an extensive freshwater marsh that is fed by both Maxwelton and Quade creeks. The creeks join in the marsh and flow out to Admiralty Inlet via a tide gate and culvert through the beach berm. The tide gate is functioning and appears to allow for very little saltwater influence in the marsh, based on the lack of salt-tolerant plant species. The buffer around the marsh is moderately developed for residential and farming uses, and grazing of livestock occurs within the marsh. The beach berm is densely developed for residential use. Once a historic saltmarsh, this wetland has been virtually cut off from the saltwater by diking and ditching, and buffer vegetation removed. Maxwelton Creek is a salmonid-bearing stream, with coho, chum and cutthroat trout known to occur in the system. In addition to the tidegate, a number of culverts along the mainstem of Maxwelton Creek present potential fish passage problems. The creek has been channelized through its lower reaches, and buffer vegetation removed along major reaches of the stream. However, good spawning habitat remains in some of the less disturbed reaches. Water quality is generally good with the exception of fecal coliform bacteria.

The goals that have been established for restoration of Maxwelton Estuary and Maxwelton Creek include:

1. Restore lower elevations of wetland to actively inundated saltmarsh with open tidal flushing
2. Enhance salmonid access and habitat throughout the wetland and stream system

Major actions are:

- acquire or gain easement to tidegate area between existing houses
- replace tidegate with open channel, install conspan or bridge Maxwelton Road
- acquire or gain easements for area that would be flooded following dike breaching
- meander creek channel and allow additional tidal channels to form
- replace culverts on Maxwelton Creek that impede fish passage
- study impacts of beaver activity on system, with focus on localized flooding

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- gain easements for riparian buffer and implement restoration plan
- construct boardwalk trail at headwaters of Quade Creek
- restore and manage stream system for coastal cutthroat and anadromous salmonids

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey of area behind dike/beach berm
2. Conduct hydraulic analysis to determine extent of area behind dike that could potentially be flooded following dike/beach berm breaching; determine whether existing houses on beach berm will need protection from flooding
3. Evaluate need for removal of dairy farm ponds prior to dike breaching
4. Conduct water quality study to determine how ongoing livestock grazing is affecting the wetland and whether septic systems from beach berm houses are affecting water quality
5. Collect streamflow data and study existing salmonid use of Maxwellton Creek including details on existing habitat availability and quality to determine benefits of improving passage at various culverts in the system

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Maxwelton Creek

Maxwelton 31.0 km² is the largest sub-basin in WRIA 6-Island County with a shoreline is about 4.3 km in length. The Maxwelton watershed is located on the west side of south Whidbey Island. Maxwelton Creek generally flows in a southwest direction from headwaters north of Miller Lake, wetland systems and from hillside springs into the Maxwelton estuary and then into Useless Bay. Low flows can be a limiting factor during dry summer months. The fish usage in this watershed includes chum, coho, and resident Cutthroat trout. The WDFW does not stock trout or other fish in Miller lake. Beavers exist throughout the watershed including Miller Lake.

The lower valley has been farmed since at least 1863. The marsh has been used for agricultural purposes, resulting in stream channels being straightened, diked and ditched. Tidal flows are controlled by a 60-inch tide gate. Diking District 2 is responsible for maintaining the tide gate.

Access is a major factor affecting fish production in the Maxwelton estuary and stream system. There are at least 36 culverts both private and public on the of Maxwelton Creek system many of these are fish barriers. The tidegate at the mouth of the stream is the most serious concern. The tide gate is impeding tidal waters from entering the Maxwelton marsh. Maxwelton Road is also functioning as a dike. The marsh is presumably not providing an estuarine transition zone between freshwater and saltwater bodies that is beneficial to salmonids. A private dam has been constructed for esthetic purposes on the upper left tributary that drains to Miller Lake.

Maxwelton Creek is channelized throughout its lower reaches and in other portions where agricultural practices predominate. The riparian buffer vary from pasture to the creek edge to mature conifer forests. The majority of the riparian buffer has been impacted by historic and present human development. Mature conifer stands comprise only about 10% to 15% of the riparian buffer in the drainage. Some sections of the stream have not been altered and remain stable. Some of these protected areas have extensive gravel spawning areas.

Maxwelton Creek Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

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Project list

- Develop a plan to restore and manage the stream system for residential cutthroat trout and anadromous salmonids.
- Investigate acquisition or easement options with the Diking District and landowners that own land occupying the historic estuary site and adjacent buffer area.
- Remove the tidegate and reconstruct the channel at the mouth of the stream. Bridge the channel to allow vehicles continued use of Maxwellton Road.
- Restore historic channel configurations in ditched areas and distributary channels in the estuary.
- Replace the culverts at Ewing Road, under Maxwellton Road north of Erikson Road, and under French Road with arch or box culverts to allow for fish passage.
- Vacate Erikson Road, remove the damaged culvert, and construct a pedestrian walkway over the stream.
- Enter into cooperative agreements with private property owners to replace culverts that are barriers to fish passage.
- Initiate a study of historic and current beaver activity in the Maxwellton drainage, and potential impacts on salmonid productivity.
- Encourage and aid private landowners to improve culverts that pose fish passage problems.
- Develop and implement a seasonal survey of fry that have been planted in the creek.
- Construct a boardwalk trail at the headwaters of Quade Creek to protect the wetland headwaters from impacts by hikers.
- Provide protection for the riparian buffer by acquisition or conservation easements, and establish partnerships with local landowners to conduct riparian restoration projects.
- Identify and protect the headwaters of Maxwellton Creek through acquisition or easements.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

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North Bluff Creek (Houston)

The Houston watershed is located in central Whidbey Island south of the town of Coupeville. North Bluff Creek drains from the hillside spring feed headwaters northeast to Saratoga Passage. Channel conditions are presumed to be intact because the riparian zone is in good condition. The riparian habitat throughout much of the stream's reach is dominated by mature conifers, and has only marginal impacts from development. Topography of the Houston watershed has precluded the establishment of a salt marsh with fluctuating tidal waters at the mouth of the stream.

The North Bluff Road culvert at the mouth of North Bluff Creek is believed to be blocking anadromous fish passage. The North Bluff Road culvert does not appear to be a fish passage barrier but might be under capacity.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Conduct further analysis of the culvert at the mouth of stream and replace if fish passage is a problem.
- Identify and protect the headwaters of North Bluff Creek through acquisition or conservation easements
- Investigate options for protection of the riparian corridor through acquisition or conservation easements.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

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Old Clinton Creek (Brighton)

The Brighton watershed is located in southeastern Whidbey Island. Old Clinton Creek flows from its headwater springs in a forested area west of Highway 20 east to Possession Sound. There appears to be a fairly healthy mature forest buffer along most of the creek's length. There are some impacts from residential and commercial development. The mouth of the stream and its estuary have been replaced with a housing development built on fill.

The channel appears to be stable for most of its length except where it has been tightlined. The creek has also been channeled into a culvert underneath State Route 520 and associated commercial developments. The stream has been split in its lower reach with a man-made channel that diverts a portion of its flow. A tidegate is located at the mouth of Old Clinton Creek and the stream has been tightlined under roads and houses.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Provide protection for the riparian buffer through acquisition or easements, and initiate partnerships with local landowners to conduct riparian restoration projects.
- Identify and protect the headwaters of the stream.
- Develop a plan to restore and manage the stream system for coastal cutthroat.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

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Race Lagoon

Race Lagoon is located on the east shore of central Whidbey Island, east of Smith Prairie, and southeast of Coupeville. This is a small lagoon of about 30 acres in size that is fed by two small drainages. The lagoon is connected to Saratoga Passage by a narrow open channel at its far north end. The wetland includes an open water lagoon, mudflats, and a narrow fringe of saltmarsh. This is a relatively undisturbed marsh system with a buffer that has been partially developed for residential use. A north-trending sand spit has no development. Mowed lawns extend down to the beach in several areas, and minor shoreline modifications such as floating dock occur infrequently. The small drainages that flow into the marsh appear to have too little flow for spawning habitat, but juvenile salmonids may use them. Juvenile access to the streams may be impeded by culverts under Race Road.

The goals that have been established for protection and restoration of Race Lagoon include:

1. Protect high quality estuary
2. Limit additional development in estuary buffers
3. Provide salmonid access to stream that enter Race Lagoon

Major actions are: acquire sand spit or gain conservation easements to protect sand spit from development

- acquire riparian buffer area or gain conservation easements to protect and restore riparian vegetation
- conduct study to determine changes in the channel configuration and sediment movement in relation to past shoreline development
- develop adopt-a-lagoon program among local landowners regarding landscape and septic system impacts and to develop revegetation plans for shoreline
- assess potential for access for juvenile salmonids into two drainages that enter lagoon and enhance access as needed

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be

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collected. The preliminary tasks that would need to be performed to collect this information include:

1. Topographic survey of lagoon and marsh to determine sediment deposition
2. Conduct water quality study to determine how landscaping practices and septic systems may be impacting marsh
3. Contact homeowners association to determine willingness to work with Island County to develop protection measures for marsh
4. Collect streamflow data and study existing salmonid use of drainages entering marsh, including details on existing habitat availability and quality to determine benefits of improving fish passage at various culverts in the system

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Swantown Lake

Swantown Lake is located on the west shore of north Whidbey Island, to the west of Oak Harbor and south of Ault Field. The wetland is roughly 100 acres in size, and includes freshwater marsh, saltmarsh, mudflats, and open water. Swantown Lake is fed by a creek that enters the southeast corner of the marsh. The origins of the marsh are unknown but it currently receives saltwater via two culverts with flapgates and a tidegate. Salmonid access is blocked by the tidegate. The buffer of the marsh have largely been cleared for farming and livestock grazing, as well as for West Lake Road. Historic farm ditches can still be seen in the marsh. Houses line the entire beach berm between the lake and Admiralty Inlet. Swantown Lake currently provides habitat primarily for waterfowl and shorebirds. The creek that flows into Swantown Lake originates on the Whidbey Golf & Country Club. This creek has been straightened and channelized, and its riparian vegetation has largely been cleared.

The goals that have been established for restoration of Swantown Lake and the adjoining creek include:

1. Provide long-term protection for large wetland/stream system
2. Restore open saltwater flow to wetland
3. Restore anadromous fish access to marsh and enhance the fish and wildlife habitat of both wetland and stream.

Major actions are:

- acquire or gain conservation easements for portions of marsh and riparian corridor not currently owned by Island County
- remove culverts, tidegate and other drainage structures near main wetland outlet
- restore open connection to saltwater by creating open channel between lake and saltwater
- install box culvert or conspan or bridge West Lake Road
- locate open channel where outlet culvert and tidegate currently lie, or near southwest corner of lake
- fill in ditches that parallel West Lake Road and other ditches in marsh
- plant wetland buffer
- post interpretive signs in wetland buffer
- assess hydrology of wetland and install structures to prevent downcutting of outlet channel

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- develop plan for restoring creek between golf course and Swantown Lake and managing for salmonid use
- Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:
1. Conduct topographic survey of marsh area to determine potential extent of flooding
 2. Conduct hydraulic and flooding analysis to determine extent of area that could potentially be flooded following beach berm breaching, best angle and location for opening, and whether existing houses on beach berm will need protection from flooding
 3. Conduct water quality study to determine how livestock grazing is affecting the wetland, whether septic systems from beach berm houses are affecting water quality, and quality of creek flowing into lake
 4. Collect streamflow data in creek and assess potential for spawning habitat
 5. Evaluate potential effects of existing seawalls on outer beach with regards to maintaining proposed channel mouth
 6. Evaluate stability of West Beach Road given expected higher flood levels in lake

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Swantown Creek (Swantown)

The Swantown watershed 18.0 km² is the sixth largest drainage in WRIA 6. Located on the west side of north Whidbey Island west of Oak Harbor and south of Ault Field the drainage flows in a northwest direction via Swantown Creek and its tributaries. The headwaters of the stream are formed by wetlands. There is approximately 2.0 km of shoreline. The riparian corridor associated with Swantown Creek is in relatively poor condition. Swantown Creek has been diked and ditched throughout much of its extent. Swantown Creek is now intermittent and much of the stream has been channelized. It is not known to support salmonids at this time, but has potential salmonid habitat with restoration. Anadromous fish (chum, coho and coastal cutthroat) could potentially use Swantown Creek up to the culvert at Fairway Lane at the Whidbey Golf and Country Club. The creek is pumped out of the golf course ponds at this location. The stream drains to a brackish wetland called Swantown Marsh (also known as Swan Lake or Bos Lake), located near the coastline just east of West Beach Road and west of Swantown Road. The tidegate at the northwest corner of the Swantown marsh is limiting salt water exchange and precluding salmonid access to the Swantown stream system.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Explore remaining acquisition or conservation easement opportunities for properties in the vicinity of Swantown marsh and the riparian corridor along Swantown Creek.
- Reconstruct the stream channel in the lowland farmlands.
- Remove exotic species and revegetate the riparian areas associated with the stream channel.
- Evaluate the potential for flooding from upstream development.
- Provide protection for the riparian buffer through acquisition or easements, and initiate partnerships with local landowners to conduct riparian restoration projects.
- Identify and protect the headwaters of Swantown Creek.

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- 1 • Inventory the creek system. Develop a plan to restore and manage the
- 2 Swantown Creek system for the reestablishment of coastal cutthroat and
- 3 anadromous salmon.
- 4

5 **Studies and data gaps**

- 6 ♦ Install a stream gage to gather data on annual streamflow
- 7 ♦ Creek Inventory and restoration plan
- 8

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Camano Project Lists

Arrowhead Point

Arrowhead Point is located at the northern tip of Camano Island, to the east of Brown Point. There is a small marsh on the east side of this point that is roughly 13 acres in size. The marsh has a narrow open channel to Skagit Bay at its east end. A north-south dike splits the marsh, with mostly brackish and freshwater marsh lying behind the dike. Outside the dike is saltmarsh with small areas of mudflat and open water. The saltmarsh portion of the wetland is largely dominated by Spartina, with about 50 percent of the total marsh being covered by this invasive species. The west and north buffers of the marsh include access roads and a very dense housing development. The marsh is owned by the homeowners association. Houses extend over much of the length of the beach berm, and it is possible that some fill of the marsh was done to provide for access for the development. It is suspected that the outlet channel has narrowed over time, and may be closing off. The small size of this channel limits the tidal circulation in the marsh and likely contributes to the extent of Spartina. Salmonid use of the marsh is unknown, but it is likely that juvenile salmon enter the system. Fish access to the west portion of the marsh is blocked by the dike. Extent of Spartina clogging tidal channels in marsh may affect salmonid use.

The goals that have been established for restoration of the marsh at Arrowhead Point include:

1. Provide long-term protection for marsh from additional alterations
2. Restore tidal flushing to entire marsh to revert all of it to saltmarsh
3. Restore fish access to west half of marsh
4. Manage invasive species to increase native plant diversity and enhance wildlife habitat

Major actions are:

- acquire marsh area or enter into conservation easement agreement with homeowners association to protect marsh
- create broad opening in dike or remove entire dike
- install soldier pile wall along south edge of row of houses to protect from flooding
- help homeowners association develop adopt-a-lagoon program

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- conduct study of outlet channel to determine how to widen and maintain opening
- develop and implement long-term management plan for reducing coverage of Spartina
- conduct study of water quality in marsh and develop plan for managing pollution sources

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey of area behind dike to determine extent of flooding following removal of dike; determine how to best protect structures from flooding
2. Conduct hydraulic analysis of system to determine effects on marsh of breaking dike vs. removing entire dike, and to determine potential for flooding homes under each scenario, as well as determining best location for breaching dike
3. Conduct survey of existing Spartina and past records of Spartina occurrence to determine reasons for severity of problem and best method for management
4. Determine what measures have been tried in the past to control Spartina

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Carp Creek (Carp)

The Carp watershed 6 km² is located on the northeast side of Camano Island and has 2.4 km of shoreline. The headwaters of Carp Creek are formed by hillside springs in forested land and Carp Lake. Carp Creek drains the basin, flowing east to Saratoga Passage. The middle section of Carp Creek is highly impacted by residential development. The existing riparian buffers are narrow and highly manicured. The upper reaches have recently been impacted by logging practices. The basin is noted in this report for its potential salmon habitat. There is potential for salmonid use from the mouth to Carp Lake.

Access is the major factor limiting salmonid use of Carp Creek. Two access problems have been identified. The first is located at Madrona Beach Road. The 18-in culvert extends to Sunset Drive and is perched about 0.6 m above the stream surface. The second is located at Sunset Drive where there is an undersized culvert. Removal of the fish passage barriers would allow chum salmon to spawn in the lower reaches of the stream.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Replace the perched culvert at Madrona Beach Road with a new culvert that will allow for fish passage.
- Acquire (through acquisition or easement) the lot at Sunset Drive, remove the concrete culvert at the mouth of the stream, and restore an open channel.
- Remove and reconfigure the fish passage barrier at the tributary.
- Provide protection for the riparian buffer through acquisition or easements, and initiate partnerships with local landowners to conduct riparian restoration projects.
- Identify and protect the headwaters of the stream.
- Inventory the creek system. Develop a plan to restore and manage the stream system for the reestablishment of coastal cutthroat and anadromous salmon.

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Carp Creek (Carp)

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

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Cavalero Creek

The Cavalero watershed 3 km² is located immediately south of the Triangle drainage and has 1.6 km of shoreline. Cavalero Creek drains from hillside springs and wetlands fed headwaters west to Port Susan. The channel conditions appear to be stable throughout most of the areas that have been investigated. The riparian habitat of Cavalero Creek is generally intact. Invasive exotic species are present in some locations where land disturbance has occurred. The sub-basin is noted for potential salmon habitat.

A perched culvert downstream of East Camano Drive is the main access problem associated with Cavalero Creek. If this structure were replaced with a fishway or an oversized baffled culvert, salmonids could use the creek system to East Camano Drive. Downstream, a culvert is located at Country Club Drive. Here the stream channel requires some vegetation management, but the culvert allows for fish passage. The mouth of the stream has been tightlined under a residential structure. The associated estuary was probably destroyed by fill and bulkheads. There is a dredged lagoon that receives a large volume of runoff from adjacent developments and hillside springs. A log bulkhead has been constructed on the nearshore side of a sandfill parking lot. The mouth of Cavalero Creek is marked by two tidegates. The tidegates allow for fish passage.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Replace the 61-cm culvert with a fishway or an oversized baffled culvert to allow salmonids access to East Camano Drive.
- Implement vegetation management at the area near the culvert at Country Club Drive.
- Further analysis is warranted.

Studies and data gaps

- ◆ Install a stream gage to gather data on annual streamflow
- ◆ Creek Inventory and restoration plan

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Chapman Creek

Onamac watershed is located on the west side of Camano Island in the center of the island. Chapman Creek flows from its hillside spring and pond fed headwaters west to Saratoga Passage. Cutthroat Trout and Chum have been documented in this creek system. The riparian zone of Chapman Creek is in relatively good shape in the vicinity of West Camano Drive. Here there is mostly native forest vegetation and there is good canopy cover. The buffer on the right bank has been limited by a road that is parallel to the creek. Exotic plants are invading the riparian area near the pond and culvert at Chapman Road. The topography of the Chapman Sub-basin has precluded the establishment of a saltmarsh at the mouth of Chapman Creek.

Fish passage is obstructed by a culvert under West Camano Drive. The water discharges about 3 m above the ground, and is undermined at the outfall. A small dam was constructed near Chapman Road to create a small pond. A series of log wiers create pools that enable the fish to migrate though the system. The dam does not appear to be blocking fish passage.

While the constructed pond near Chapman Road does not pose access problems, these types of structures can contribute to elevated stream temperatures and may trap sediments. Chapman Creek has also been routed into a ditch at this location. One of the headwaters of Chapman Creek have been converted into a mini golf course with a series of ponds and turf to the edge of the channel. There is some concern that well withdrawals may be having an impact on creek flows which will limit the restoration potential of the system.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Explore acquisition options at the mouth of the stream.
- Replace the culvert and outfall at West Camano Drive to allow for fish passage, and build a set of structures to address gradient concerns.
- Remove invasive exotic vegetation at the identified locations along the stream corridor.
- Re-route the creek out of the ditch and into the adjacent wetland near the pond.
- Add root balls to the pools associated with the pond to provide instream cover.

Island County-WRIA 06 Salmon Strategy

- 1 • Provide protection for the riparian buffer through acquisition or
- 2 easements, and initiate partnerships with local landowners to conduct
- 3 riparian restoration projects.
- 4 • Identify and protect the headwaters.
- 5 • Inventory the creek system. Develop an action plan to restore and manage
- 6 the stream system for the reestablishment of coastal cutthroat and
- 7 anadromous salmon.

9 **Studies and data gaps**

- 10 ♦ Install a stream gage to gather data on annual streamflow
- 11 ♦ Creek Inventory and restoration plan

Island County-WRIA 06 Salmon Strategy

Elger Bay

Elger Bay is located on the southwest shoreline of Camano Island, adjacent to Saratoga Passage. It is roughly 50 acres in size and is privately owned by the homeowners association. The marsh has been protected in a conservation easement by this association. The marsh at Elger Bay includes saltmarsh, mudflats, and open water. A very extensive area in the marsh is covered by woody debris, Elger Bay apparently having been a major trap for drifting wood over many years. It is not known whether new wood is currently entering the marsh. Housing developments are currently under construction on the hillside to the north of the marsh, and on the beach berm. Recent modifications to the beach berm include the installation of a soldier pile wall, grading to create a broader flat area, new platting and marking of at least six lots, and widening and paving of the access road. Previous to these modifications, there were two houses on the beach berm and a narrower gravel access road. Historic topographic maps show no beach berm at this marsh, leading to the conclusion that this berm may have been entirely constructed for residential use. The outlet channel is narrow and may be filling with sediment. Tidal circulation in the marsh is limited by the size of this channel and by the extensive coverage of logs. It is not known what effects this woody debris may have on salmonid use of the marsh. *Spartina* is present over significant portion of marsh. There are no streams associated with Elger Bay.

The goals that have been established for restoration of Elger Bay include:

1. Improve tidal exchange in marsh
2. Enhance salmonid habitat in marsh, primarily for juvenile rearing
3. Enhance wildlife habitat in marsh, primarily for waterfowl
4. Ensure long-term protection for estuary, including undeveloped portion of beach berm

Major actions are:

- design and implement study to determine existing salmonid use of estuary, and potential effects on salmon of extensive coverage by logs
- develop plan for removing some of logs
- design and implement study of circulation patterns both outside and inside of beach berm to determine processes of channel formation and beach berm development, effects of new soldier pile wall, deposition rate of sediment in marsh and channel

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- 1 • explore increasing width of channel by excavation of beach berm to
- 2 east of channel
- 3 • explore options for extending existing conservation easement to
- 4 include undeveloped portion of beach berm
- 5 • develop adopt-a-lagoon program with homeowners association
- 6 •
- 7 Prior to developing more detailed plans and applying for environmental
- 8 permits, a variety of data and background information will need to be
- 9 collected. The preliminary tasks that would need to be performed to collect
- 10 this information include:
- 11 1. Study water quality within marsh to determine if any impacts can be
- 12 detected from surrounding development
- 13 2. Other studies already above as major actions
- 14
- 15
- 16

Island County-WRIA 06 Salmon Strategy

English Boom

English Boom is located along the north shore of the east half of the isthmus that connects Camano Island to the mainland. This shore is adjacent to the south end of Skagit Bay. English Boom is a very extensive area of saltmarsh, mudflat and beach berm, covering over 500 acres. It is a complex system with saltmarsh and tidal channels on either side of the long beach berm. The site displays good plant diversity and high quality habitat for waterfowl, shorebirds, and raptors. The nearshore area is likely used extensively by salmonids. Many of the tidal channels within the marsh are very small, with narrow openings to the bay, but it is likely that some of these channels and backwater areas are used by juvenile salmon for rearing. A large number of decaying pilings remain from an extensive pier system that may have been a log yarding site. These pilings provide perches for fish-hunting birds such as bald eagle, osprey and heron. *Spartina* is estimated to occur over 10 percent of the site. The Washington Dept. of Ecology manages the site for saltmarsh mosquito control. Island County currently owns about five acres near the west end of English Boom. Davis Slough passes through the east end of the site. A portion of the marsh near its east end was historically diked and ditched for farming purposes. The buffer along the south edge of English is mostly forested and in good condition. This is primarily because development in this area is precluded by the steep slopes. An informal trail occurs on the beach berm over most of the length of English Boom.

The goals that have been established for restoration of English Boom include:

1. Provide long-term protection for English Boom
2. Increase and enhance habitat for salmonids
3. Manage invasive *Spartina* to maintain high quality habitat
4. Provide public beach access and educational/recreational opportunities

Major actions are:

- acquire more land along English Boom, as land and funding become available
- continue to actively manage site for *Spartina* control
- acquire diked area and remove entire dike, filling in dike-side ditches
- establish at least one public parking area near beach

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- post educational interpretive signs near parking area
- allow public pedestrian-only access to beach berm by formalizing existing trail on berm

Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Conduct topographic survey of area behind dike to determine extent of flooding following removal of dike; determine whether any structures will need protection from flooding
2. Conduct survey of existing Spartina occurrences to determine best method for management

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Livingston Bay

The marsh that has been identified is located along west shore of Livingston Bay. Livingston Bay lies along the south side of the isthmus that connects Camano Island to the mainland. This isthmus forms the north shore of Port Susan. Historically saltmarsh, this area (about 12 acres) was diked off from the bay in the 1940s by the family that still owns most of the marsh. In the mid-1980s, a large storm breached the dike, and the dike was never repaired. The only opening in the dike is a very narrow channel near its south end. The water in the marsh is very stagnant, and a large number of logs has collected behind the dike. Saltmarsh mosquitoes became a severe problem in the marsh around the early-1990s, and ongoing control of the mosquitoes is managed by Washington Department of Ecology and a local mosquito control board. The buffers of the marsh are forested, with the exception of the dike, and there are no known sources of pollution currently entering the marsh. Spartina is observed over about 30 percent of the marsh. There are no streams associated with this system.

The goals that have been established for restoration of the marsh along Livingston Bay include:

1. Restore saltmarsh to more extensive, active tidal flushing
2. Provide permanent protection for saltmarsh
3. Enhance salmonid and wildlife habitats in saltmarsh

Major actions are:

- enter into conservation easement agreement with property owner
- explore funding options for project
- remove majority of dike, with possible exception of leaving island of dike that is currently forested
- fill in ditch alongside dike
- allow tidal action to form tidal channels and flush out some of floating logs
- develop and implement plan for managing Spartina on the site

Island County-WRIA 06 Salmon Strategy

1 Prior to developing more detailed plans and applying for environmental
2 permits, a variety of data and background information will need to be
3 collected. The preliminary tasks that would need to be performed to collect
4 this information include:

- 5 1. Conduct topographic survey of area behind dike
- 6 2. Conduct hydraulic analysis to determine best locations for dike
7 openings and to predict tidal action in marsh given shallow sediments
8 outside of dike - assess circulation patterns both inside and outside of
9 dike
- 10 3. Conduct study on existing salmonid use of marsh
- 11 4. Assess effects of project on saltmarsh mosquito problem

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Triangle Cove

Triangle Cove is located on the East Side of central Camano Island, adjacent to Port Susan and to Barnum Point. Triangle Cove is among the top five priority sites for estuarine restoration in Island County. The cove is estimated to be about 225 acres in size, and is predominantly salt marsh with small components of mudflats and open water. Kristoferson Creek is the major stream system on Camano Island, draining to the north end of Triangle Cove. The buffers of the cove include roads, and a number of scattered houses, with a denser collection of houses on the sand spit at the mouth of the cove. Spartina is a significant problem in this bay, with some occurrence over about 50 percent of the cove. There is access to Kristoferson Creek for salmonids, but this is limited by the culverts at the mouth of the creek, and at several upstream road crossings. It is suspected that the logs that have collected at the head of the cove may impede fish passage at lower tides. Triangle Cove provides habitat for juvenile salmonid rearing and for waterfowl and shorebirds.

The goals that have been established for restoration of Triangle Cove and Kristoferson Creek include:

1. Provide long-term protection for largest estuary/stream system on Camano Island
2. Increase salmonid access to spawning habitat on Kristoferson Creek
3. Enhance wildlife habitat and native species richness

Major actions are:

- explore acquisition options for Triangle Cove
- acquire or gain conservation easements for riparian buffer of creek between cove and Russell Road
- develop and implement plan to restore lower reaches of Kristoferson Creek by removing dam on private property, restoring stream channel and planting riparian area
- close or remove Barnum Road and create open stream channel into cove or install bottomless arched culvert
- replace culverts at Russell Road with larger bottomless arched culvert
- continue to monitor and control Spartina invasion
- provide protection for riparian buffer of creek through acquisition or conservation easements, and initiate restoration projects with landowners

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Prior to developing more detailed plans and applying for environmental permits, a variety of data and background information will need to be collected. The preliminary tasks that would need to be performed to collect this information include:

1. Collect stream flow data and study salmonid use of Kristoferson Creek to determine best uses of resources for restoring creek
2. Study circulation patterns in bay to determine best way to establish open stream channel connection with Kristoferson Creek
3. Assess records of Spartina occurrence and control to determine best methods of continued management for Spartina
4. Conduct study of water quality in Kristoferson Creek to determine needs for managing sources of pollution in basin

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Kristoferson Creek (Triangle)

The Triangle watershed is located on the east shoreline of central Camano Island and has 7 km of shoreline. It is the second largest drainage on Camano Island and the eleventh largest in WRIA 6, covering 12.3 km². Drainage flows south via Kristoferson Creek from the headwaters north of Kristoferson Lake into the Triangle Cove estuary and then into Port Susan. There are two additional tributaries. One flows from the headwaters above the golf course down to its junction with the main stem at the junction of NE Camano Drive and Shumway Road. The second tributary flows east from Chelsea Lake. The riparian zone has been altered throughout most of its reaches. There are some reaches that remain naturally vegetated because the land has not been developed. There is an extensive forested-scrub/shrub wetland just north of Northeast Camano Drive. Salmon were documented in this creek in 2001. The Department of Fish and Wildlife determined that the creek has the potential to support salmonids throughout its west branch that extends up from Triangle Cove to Kristoferson Lake.

The Triangle Cove estuary is located at the mouth of Kristoferson Creek between East Camano Drive (west), Russell Road (north) and Port Susan (south). Triangle Cove has an open channel connecting to Port Susan. The cove has a natural pattern of distributary channels. The entire bay is inundated at high tide. Invasive Spartina poses the biggest threat to the Triangle Cove estuary. Access to Kristoferson Creek from Triangle Cove is a factor limiting salmonid use. A culvert at Russell Road appears to be undersized. The three small culverts at Barnum Road also pose access problems. The golf course and residential community have heavily altered the east branch of the stream, eliminating access to the upper reaches.

Goals for restoration:

- ◆ Protection and restoration of the creek for residential cutthroat trout and anadromous salmonids

Project list

- Explore acquisition options for Triangle Cove.
- Explore acquisition options for the property riparian to the stream between Triangle Cove and Russell Road.
- Locate the dam on the private property and investigate its fish passability.
- Restore the stream channel.

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- 1 • Replace the culverts at Russell Road with a larger bottomless arched
2 culvert.
- 3 • Provide protection for the riparian buffer through acquisition or
4 easements, and initiate partnerships with local landowners to conduct
5 riparian restoration projects.
- 6 • Identify and protect the headwaters of the stream.
- 7 • Develop a plan to restore and manage the stream system for the
8 reestablishment of coastal cutthroat and anadromous salmon.

10 **Studies and data gaps**

- 11 ♦ Install a stream gage to gather data on annual streamflow
- 12 ♦ Creek Inventory and restoration plan